
User's Manual

CKT3554A/B/D

BATTERY TESTER

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Introduction

Thank you for purchasing CKT3554A/B/D high voltage battery tester. To obtain maximum performance from this product, please read this manual first before operation, and keep it handy for future reference.

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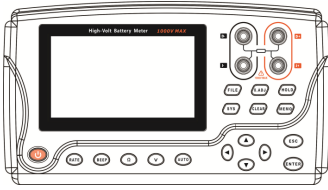
Checking Packing Contents

- When receiving instrument, please check carefully to ensure that the instrument is not damaged during transit. In addition, special inspections of accessories, panel switches and connectors are required. If the instrument is found to be damaged or it fails to operate as described in the user manual, please contact us.

- To transport this instrument, use the original packaging and wrap it in a double carton. Damage during transportation is not covered by the warranty.

Checking Packing List:

| | Item No. | Qty |
|---|---------------------------------------|-----|
| 1 | 3554A/B/D High Voltage Battery Tester | 1 |
| 2 | User' s Manual | 1 |
| 3 | USB Communication Cable | 1 |
| 4 | Test Leads | 1 |
| 5 | Temperature Sensor | 1 |
| 6 | Brace | 1 |
| 7 | Lithium Battery | 1 |



3554A/B/D High Voltage Battery Tester



9363A Test leads



9348 Temperature sensor



Lithium battery



DC power adapter



Mini-USB cable



Safety Notes

The instrument is designed to comply with the IEC 61010 safety standard and has been thoroughly tested for safety prior to shipment. However, if it is used improperly, it may cause injury or death and damage the instrument. Be sure to read through this manual and its precautions before use. Our company does not assume any responsibility for accidents and injuries caused by non-defects in the instrument itself.

Safety Signs

This manual contains the information and warnings necessary to operate the instrument safely, which are necessary to ensure that the instrument is in safe operating condition. The following safety precautions must be read carefully before use.



The sign  in the manual shows particularly important information that should be read carefully before using this machine.  is brushed on the instrument, indicating that users must refer to the corresponding topic in the manual before using the corresponding function.



Stands for DC (Direct Current).



Stands for fuse



Stands for ground terminal

The following signs in the manual indicate important considerations and warnings.



DANGER

Indicates that the operation is improper and extremely dangerous, which may result in serious injury or death.



WARNING

Indicates improper operation and is extremely dangerous and may result in serious injury or death.



CAUTION

Indicates improper operation that could result in injury or damage to the instrument.



NOTE

Indicates recommendations related to the performance of the instrument or normal operation method.

Accuracy

We use f.s. (full range), rdg. (reading) and dgt. (resolution) values to define measurement tolerances, which have the following meanings:

f.s. (maximum display value or measurement range)

Maximum display value or measurement range. Usually it is the currently selected range name.

rdg. (reading or display value)

The currently measured value and the value displayed on the measuring instrument.

dgt. (resolution)

The minimum displayable unit of the digital tester, that is, the input value that causes the digital display screen to display the least significant digit "1".

Operation Notes

Instrument Setup

- Operating temperature and humidity:
0 ~ 40 ° C, below 80% RH (no condensation)
- Temperature and humidity range that can ensure accuracy:
23 ± 5°C, below 80% RH (no condensation)
- To avoid malfunction or damage to the instrument, do not place the instrument in the following situations:
- Places where the sun is shining directly at high temperatures.
- Place where the liquid temperature will splash is high and condensation occurs.
- Exposed to dusty places
- Locations where corrosive or explosive gases are flooded
- Locations with strong electromagnetic fields and electromagnetic radiation
- Places where mechanical vibration is frequent

Checking before use

Before the first time of using this instrument, verify that the operation is normal and that there is no damage during storage or transportation. If finding any damage, please contact us.



WARNING

Before using the instrument, make sure that the test leads are well insulated and whether there are conductors exposed. If a similar situation occurs, there is a danger of electric shock when using this instrument. Please contact us.

Handling Precautions



DANGER

To avoid electric shock, do not disassemble the instrument case. There are high pressure and high temperature parts inside the instrument during operation.



CAUTION

To avoid damage to the instrument, physical shock should be prevented when handling and operating the instrument. Special care should be taken to prevent the instrument from falling



NOTE

In order to avoid problems with battery leakage corrosion and battery degradation, remove battery from the instrument if don't use it for long time.

- Be sure to turn off power after using it.

Measurement Considerations



DANGER

To avoid electric shock and short circuit, the following procedures must be observed:

- Don't test voltages above 1000VDC.
- Don't test alternating voltage.
- Make sure the test leads are connected correctly.
- Wear rubber gloves or rubber-like gloves during the measurement.
- When testing the battery, ensure that the ventilation is smooth. When the test leads are connected, sometimes a spark is generated, and it is easy to ignite an accumulated combustible gas such as hydrogen.

Handling Leads and Cables



NOTE

- For safety, please use the test leads which are supplied with the instrument when testing.
- To avoid damaging to test leads, do not bend or stretch the test leads.
- The probe at the front of the test leads is sharp, taking care not to be scratched.
- To avoid damage to the test leads, do not take the cables while you are plugging or unplugging the test leads. Hold the connectors.

Chapter 1 Overview

1.1 Introduction

3554A/B/D Battery Tester is a test instrument that measures the internal resistance, voltage, and port temperature of lead-acid batteries, nickel-cadmium batteries, nickel-metal hydride batteries, lithium batteries, and other types of batteries.

After testing, connect instrument to a personal computer by using the supplied USB cable and test data can be downloaded to PC.

1.2 Characteristics

□ **Reliable measurement**

Since the instrument uses a four-terminal AC method to test internal resistance, the measured value is not affected by the test leads or contact resistance, so it is more reliable.

□ **Resistance, voltage and temperature display simultaneously**

The instrument's internal resistance, voltage, and port temperature can be displayed simultaneously without changing the function.

□ **Comparator function**

The instrument's comparator function can be used to set internal resistance and voltage thresholds, battery test results are more realistic and reliable.

□ **Large storage capacity**

Combining the current test values (resistance, voltage, temperature, and comparator test results) into one set, the instrument can store up to 2400 sets of data, it can measure 12 units of data, each unit 200 sets of

cells.

□ **Automatic storage function**

Once this function is set, test data is automatically stored in the instrument's memory. This will increase operational efficiency.

□ **PC interface**

Test data can be downloaded to a PC.

□ **Small size**

The length and width of the instrument are approximately equal to the size of an A5 sheet and it is easy to carry. The instrument weighs only about 800 g, users will not be tired after a long test.

□ **9363B probe type test leads (optional)**








When using 9363B probe type test leads, it can be tested without opening the port cover because it has a front-end probe that can test a hole with a diameter of only $\varnothing 5$ mm. The probe can be inserted diagonally to the hard-to-reach point, so the instrument can test any position.









□ **Remote control switch for storing test values**

Using manual control switch in the option, test value can be stored and maintained with a simple button. This switch is especially useful when the operator's hands are busy with operation.

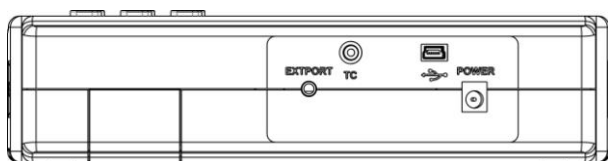
1.3 Component Names and Operation Overview



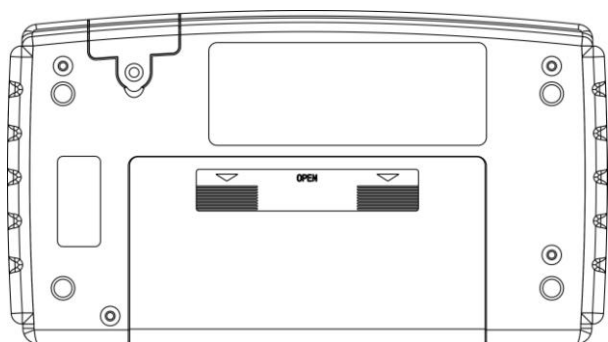
| | |
|---|--|
|  | Used to turn on/off power supply. |
|  | Used to turn on/off beep. |
|  | Used to set test speed. |
|  | Used to select a setting item or change a value. |
|  | Used to confirm the settings. |
|  | Used to exit the settings. |
|  | Used to keep the display value or cancel the hold. |

| | |
|---|---|
|  | Used to store display values in memory. |
|  | Used to switch system setup page. |
|  | Used to call stored test values. |
|  | Used to delete stored test values |
|  | Used to perform clear zero function. |
|  | Used to switch the resistance range. Press this button to display the currently set range. Continue to press this button to switch settings after the loop display below. |
|  | Used to switch the voltage range. Press this button to display the currently set range. Continue to press this button to switch settings after the loop display below. |
|  | Used to set auto range test. |

Top side



Back side

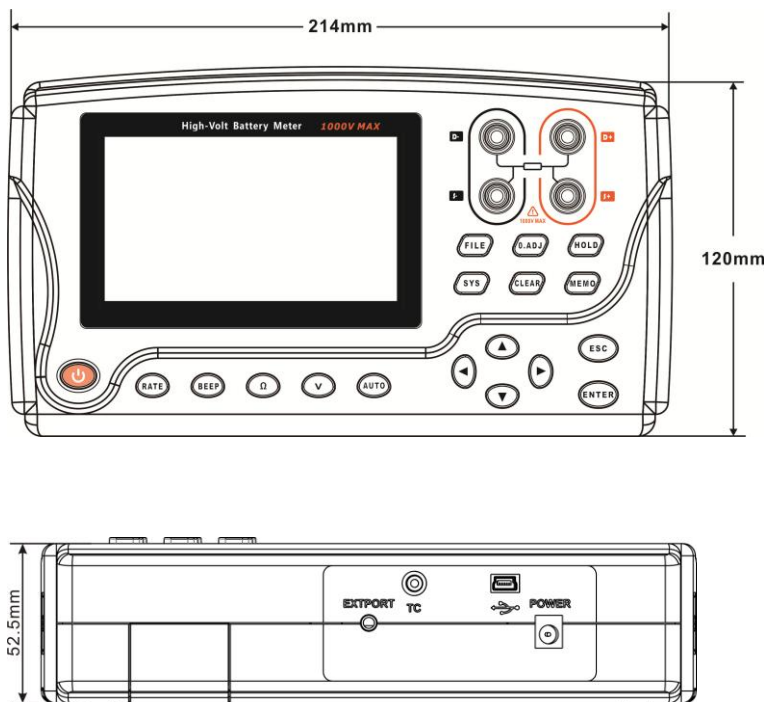


1.4 Measurement Process

Test flow is shown below.

| | |
|------------------------------|--|
| Test preparation | <ol style="list-style-type: none">1. Install strap2. Check the remaining battery capacity of the instrument3. Connect test leads4. Turn on the power5. Set the clock |
| Measurement related settings | <ol style="list-style-type: none">1. Set resistance range2. Set voltage range |
| Clear Zero | Perform clear zero operation according to the test leads requirements shown |
| Start testing | <ol style="list-style-type: none">1. Connect test leads to the tested object.2. Read test value.3. Keep test values.4. Store test values. |
| Test completes | <ol style="list-style-type: none">1. Disconnect the test leads and turn off the power2. To download the stored test data to PC, connect the instrument to a computer with a USB cable to transfer the data. (Need to install data transfer software). |

1.5 Dimension



Chapter 2 Preparing for Measurement

2.1 Install Strap

Install the strap, instrument can be hung on the user's neck. Instructions for use are as follows.



NOTE

Fasten 4 ends of the strap to the instrument.

If it is not fastened, the instrument may fall and cause it to break or hurts people when they move.

1. Turn off the instrument and remove test leads.
2. Pass the strap through 2 sides of the instrument attachment and fasten with the buckle at the appropriate location.



3. Adjust the strap length.

2.2 Install or Replace the Battery

When using this instrument for the first time, install 8 LR6 alkaline batteries or lithium batteries. Make sure the battery has enough power before testing. When the battery is low, replace the battery or charge it in time.



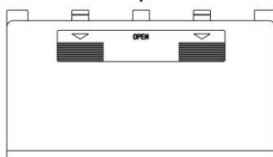
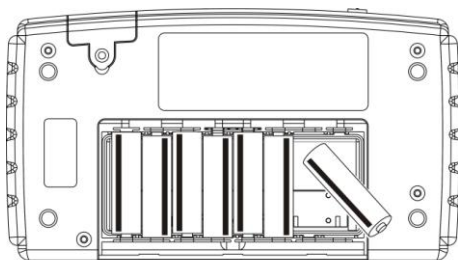
WARNING

- To avoid electric shock, the power must be turned off and test leads disconnected before replacing the battery. After replacing the battery, the battery cover must be covered to use the instrument.
- Do not mix old and new batteries or different types of batteries. In addition, the polarity of the battery should be noted during installation. Otherwise, battery leakage can affect the performance of the tester or cause damage.
- To avoid the possibility of an explosion, do not short-circuit, disassemble, or incinerate the battery.
- Dispose of batteries in accordance with local regulations.
- When using a lithium battery, use the charger provided by our company when charging, otherwise the lithium battery may be damaged or its life time may be shortened.
- Dispose of dry batteries in accordance with local regulations and scrap them. Do not discard them.

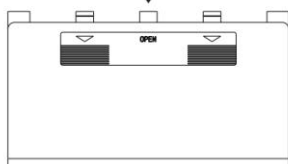
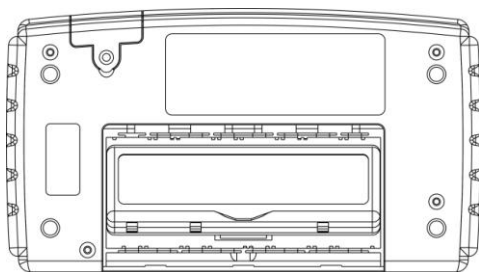


NOTE When battery indicator indicates that the battery is low, charge or replace the battery as soon as possible.

1. 1. Turn off the instrument and remove the test leads.
2. 2. Open the battery cover at the back of the instrument.
3. 3. Insert the battery and pay attention to the polarity of the battery.
4. 4. Install the battery cover.



Dry battery placement



Lithium battery placement

2.3 Connection of Test Leads

To avoid electric shock, make sure the test leads are properly connected.



WARNING

- For safety, please use the test leads which are supplied with the instrument.



CAUTION

- The probe at the front of the test leads is sharp, taking care not to be scratched.

Connect test leads to the instrument. Make sure all 4 ports are connected: SOURCE(+, -) and SENSE (+, -).

2.4 Turn on/off Power

Use POWER control key to turn on /off power. When using the instrument for the first time, check the clock settings.

Power on

Press POWER key to turn on the power



Screen status display



Display model number and version number



Display test



Turn off the power

Press the POWER key to turn off the power



Display off

2.5 Clock Setting

Date and time can be set in the system setup page. Check clock settings when using this instrument for the first time

2.5.1 Setup Date

1. Press **[SYS]** key on test page to switch to the system setup page.

The screenshot shows the system setup page with a blue header bar containing a speaker icon, a battery level indicator, and the date/time '02-28 17:02:30'. On the right side, there is a vertical green bar with the text 'CO', 'SET', and 'LE' in blue, orange, and red respectively. The main content area is a table with a green border. The table has the following structure:

| | | | |
|-------------|----------|---------|-------|
| DATA RECORD | | | |
| A. HOLD | OFF | A. MEMO | OFF |
| DATETIME | | | |
| DATE | 09-10-21 | TIME | 15:03 |
| OTHER | | | |
| A. SHUT | OFF | AVERAGE | OFF |
| LANGUAGE | EN | | |
| | | | |

2. Select related option

This screenshot is identical to the previous one, but the 'DATE' field in the table is now highlighted with a blue background, indicating it is the active selection for editing.

Press up, down, left and right keys to move the cursor position, press **[ENTER]** key to select date, and then press the up, down, left and right keys to adjust the value at the corresponding position.

3. Press **[ENTER]** key to save date and time settings.

2.5.2 Setup the Clock

1. Press **[SYS]** key on test page to switch to the system setup page.

| DATA RECORD | | | |
|-------------|----------|---------|-------|
| A. HOLD | ON | A. MEMO | OFF |
| DATETIME | | | |
| DATE | 09-10-21 | TIME | 15:03 |
| OTHER | | | |
| A. SHUT | OFF | AVERAGE | OFF |
| TEMP | OFF | | |
| LANGUAGE | EN | | |
| | | | |

2. Select related option

| DATA RECORD | | | |
|-------------|----------|---------|-------|
| A. HOLD | OFF | A. MEMO | OFF |
| DATETIME | | | |
| DATE | 09-10-21 | TIME | 15:03 |
| OTHER | | | |
| A. SHUT | OFF | AVERAGE | OFF |
| TEMP | OFF | | |
| LANGUAGE | EN | | |
| | | | |

Press up, down, left and right keys to move the cursor position, press **[ENTER]** key to select clock, then press up, down, left and right keys to adjust the value at the corresponding position.

3. Press **[ENTER]** key to save clock settings.

Chapter 3 Measurement

For testing safety, read this chapter before testing.



DANGER

The following procedures must be observed to avoid electric shock and short circuits.

- Do not measure voltages above 1000 VDC.
- Do not measure voltages above 70 VDC to ground.
- Do not measure alternating voltage.



NOTE

- Note that if the applied voltage or current exceeds measurement range, the instrument will be damaged.
- After measuring the high voltage battery, put test leads together, short-circuit them, then test the low voltage battery. This can remove the power of DC cut-off capacitor in the unit, otherwise the overvoltage applied to the low voltage battery may damage the battery.



CAUTION

- The internal resistance of the battery varies significantly depending on state of charge or discharge. In order to improve test accuracy, it should be tested under the same conditions (such as battery full).
 - Lead-acid batteries (test materials) have high electrode impedance. Accordingly, the resistance value between the side and the top of the electrode is different. Make sure the test leads are connected to the

fixed position of the electrodes.

- Users should use clip type test leads with temperature sensor (optional) to measure the battery temperature, or use a radial non-contact thermometer for safety reasons.
- Insulated electrodes cannot be tested due to insufficient current. In this case, clean the port (remove the insulation) before testing.

3.1 Pre-measurement Inspection

| Inspection item | Action |
|---|---|
| Whether the fuse is blown Whether test leads are connected | Touch zeroing board with the test leads. If the resistance value is still displayed as " - . - - - " , the fuse is broken or test leads are not connected. |
| Is the battery level enough? | The battery icon on the left side of the screen indicates the current battery status. |
| Test battery | Insulated electrodes cannot be tested because there is not enough current for testing. In this case, clean the port (remove the insulation) before testing. |

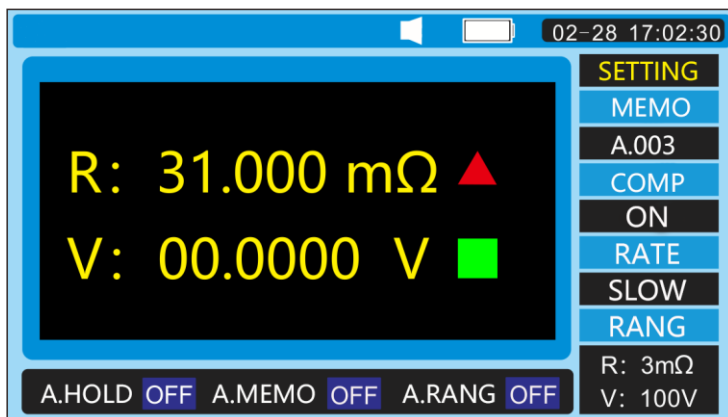
3.2 Setup Test Range

Set test range for resistance and voltage as shown below:

| | |
|------------------|--|
| Resistance range | 3 m Ω / 30 m Ω / 300 m Ω / 3 Ω / 30 Ω |
| Voltage range | 10 V / 100 V / 1000V |

Resistance Measurement Range

Press [Ω] key to display the current setting. Press this key repeatedly to select a desired range.



Under measurement page, press [Ω] to switch resistance range. Press [V] to switch voltage range. Even if auto range function is turned on, the manual range switching is valid. (Auto range is turned on, when the range is manually switched, auto range function will be automatically turned off).

Internal resistance range:

3m Ω ↔ 30m Ω ↔ 300m Ω ↔ 3 Ω ↔ 30 Ω

Voltage range:

10V ↔ 100V ↔ 1000V

Under measurement page, press [AUTO] key to switch to auto range. When set to auto range, the range is automatically turned ON, the range is automatically turned OFF when auto range function is turned off.

3.3 Clear Zero

Use clear zero function to adjust zero value of the instrument's resistance range and voltage range, this can make the measurement results more realistic and reliable. It is recommended to use the clear zero function before measurement. Clear zero function adjusts the current test value (compensation value) to 0, and then displays the test result.

**NOTE**

- Clear zero operation takes approximately 5 seconds.
- Use zero function to adjust 0 point of all ranges.
- The instrument retains the compensation value and clear zero function is not canceled after the power is turned off.
- After replacing test leads, make sure to use clear zero function before testing.
- Make sure that 9363-B performs clear zero function by using the included zero adjustment board.
- Make sure test leads are shorted during the zeroing process. The top of the test lead is not on metal components.

3.3.1 Short Circuit Method for Various Types of Test Teds

Use the supplied zero plate to short-circuit the test leads in AC four-terminal method. Select small hole that meets the distance of the battery port, center the center screw of the zero plate, press test probes at both ends symmetrically. The zero plate is at least 10 cm from the instrument.



Zero board (Optional)



Probe (Optional)



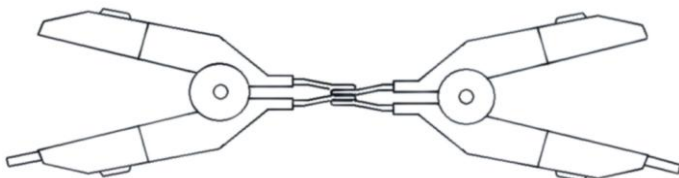
NOTE • Be sure to perform clear zero function using the supplied zero adjustment board. Also make sure that the tip of each SOURCE terminal and SENSE terminal is inserted into the small hole of zeroing plate as shown.

- Do not place zeroing plate on the battery or any metal parts. Electromagnetic induction can cause unstable measurements. In this case, move the zeroing plate away from metal components.
- Connecting the test lead probe or using other metal parts for zero adjustment without using the supplied zero adjustment plate will result in clear zero error.
- When the distance between the port on battery and instrument is greater than the distance between the small holes on the zero adjustment plate, use the small hole at the corner to perform clear zero.

9363-A Clip Type Test Leads



Short-circuit clip type test leads to perform clear zero as shown below

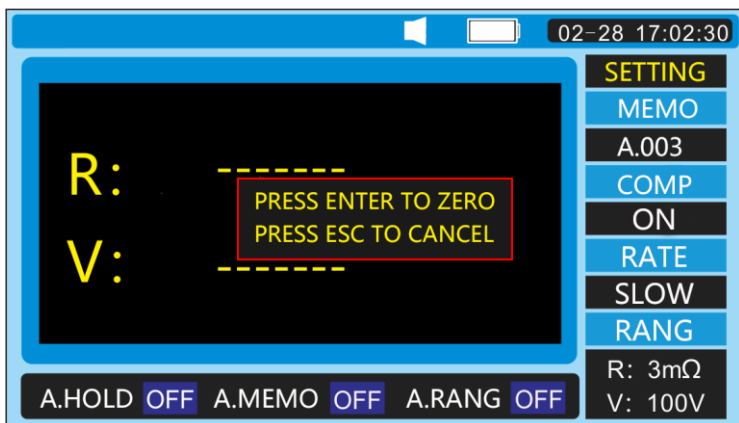


3.3.2 Perform Clear Zero

1. Check and make sure whether test leads are connected correctly.

If the test leads are connected to the tested object, remove the tested object.

2. Press **[0ADJ]** key.



3. Press OK key to start clearing zero

If test lead is not shorted, instrument will display fail in clear zero.

When screen displays the "Clear Failed" message:

If the correct compensation value is not obtained, an error message will be displayed. The error can be caused by the following reasons:

- For resistance or voltage values, the obtained compensation value exceeds 300 units.
 - Make sure the test leads are properly connected to the instrument.
 - The test leads are likely to be damaged. Try to use new test leads.
 - Try to clean the zero plate.

5. When clear zero operation is completed, the instrument returns to test state.

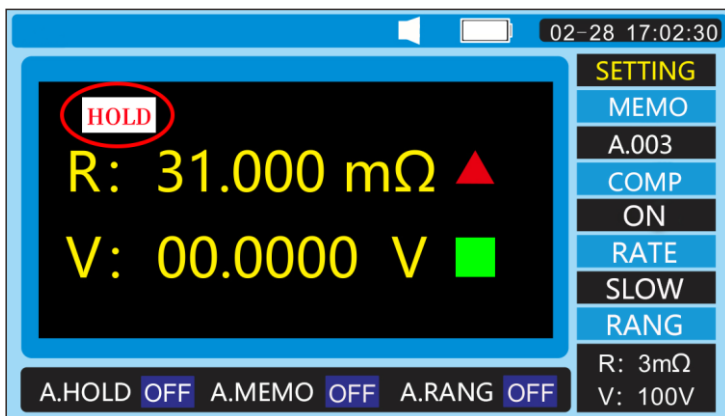
3.3.2 Cancel Clear Zero Operation

When performing zero adjustment function, press **[ESC]** key to cancel it.

3.4 Keep Displaying

3.4.1 Hold

Press [HOLD] key to keep the measured value displayed on the screen. **HOLD** icon will be displayed, and instrument screen will keep the measured value.



NOTE

- The hold function cannot be executed when the following values are displayed: "- - - - -".
- Changing the configuration will cancel hold function.
- Turning off power will cancel the hold function.

3.4.2 Use EXPORT port to perform hold function

The EXPORT port has the same function as HOLD key. The optional 9466 manual switch is required.

1. Disconnect the battery from the instrument.
2. Insert the small plug of 9466 manual switch into the EXPORT port.
3. Press **PRESS** key on 9466 to maintain the test value.
4. Press 9466 or HOLD key on the instrument to cancel the hold function.



NOTE

- Hold function cannot be executed when the following values are displayed: "- - - -".
- Do not insert or remove the small plug when test leads are connected to the battery and the object under test. The manual switch can only be connected after test leads are disconnected from the battery.
- Do not insert small plug of 9466 manual switch into TC port.

3.5 Test Battery

1. Refer to “Section 3.1 Pre-measurement Inspection” to set range and clear zero operation.
2. Connect test leads to the battery wanted to determine.
3. Read the test value.
4. Press [HOLD] key or press PRESS key on the manual switch to maintain the test value.



NOTE

- When the test value shows “OF” , it indicates that the displayed resistance or voltage value exceeds the corresponding test range.
- When the resistance value is displayed as “- - - -” , it indicates that test leads are open or the test leads are disconnected or other causes the current to be unstable and cannot be tested. “- - - -” is also displayed when test leads are not properly connected to the measured object or the resistance of measured object is far beyond the test range.
- When measuring resistance of a relay or a connector, note the maximum open circuit voltage of this instrument (up to approximately 27 V). Measurements can damage the contacts or oxide layers of the object under test, and resulting in measurement errors.

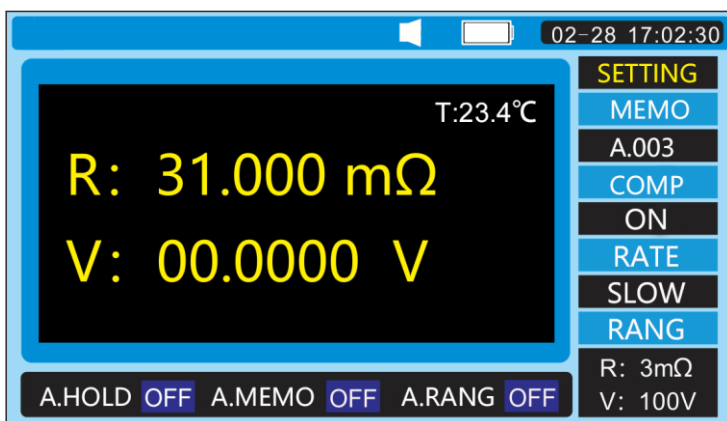
Complete Test

Remove test leads from the battery and press [POWER] key to turn off the power of instrument.

3.6 Temperature Measurement

Use the supplied PT1000 sensor to measure battery temperature. Connect sensor plug to the TC port.

The instrument will automatically detect the temperature sensor and display the measured temperature.



Temperature Display

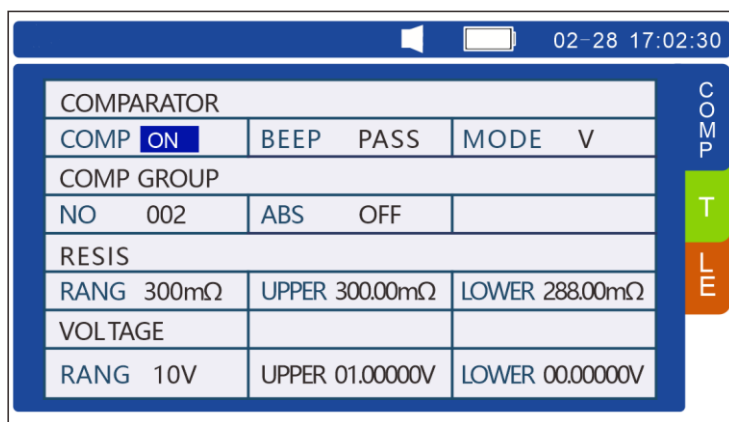
Chapter 4 Comparator Settings

4.1 Overview

Comparison function determines test conclusion by comparing preset threshold with battery test value: pass and fail. Up to 200 comparison conditions can be set. In the initial setting, the beep will sound when test result is in NG range.

4.2 Turn on Comparator

1. Press **[SYS]** key on the test page and switch to comparator page.

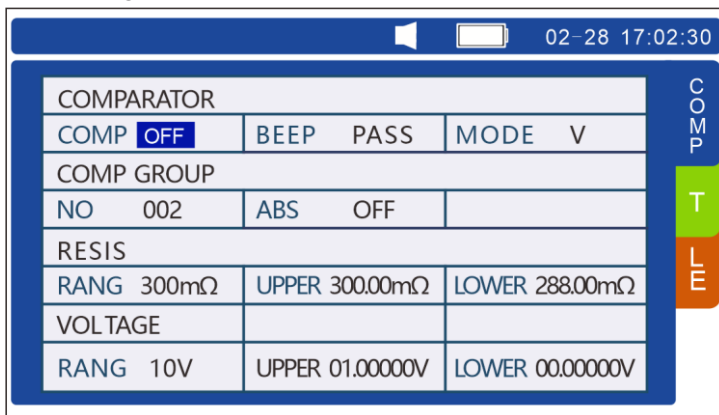


Press up, down, left and right keys to move cursor to the comparator switch position, press **[ENTER]** key to select the comparator switch, and then press left or right key to set comparator ON or OFF. Press **[ENTER]** key to store the comparator turn on/off.

4.3 Setup Comparator Group Number

The instrument has 200 record group save functions.

1. Press **[SYS]** key on test page and switch to comparator page.



Press up, down, left and right keys to move cursor to comparator group number, press **[ENTER]** to set the group number, then press left or right key to set the record group 1-200. Press **[ENTER]** key to store the comparator record group number.

4.4 Setup Comparator

1. Sorting conditions and results relation

| Conditions | Relation |
|--|-------------------------|
| Resistance upper limit \leq current resistance value \leq resistance lower limit | Resistance GD |
| Current resistance value $<$ resistance lower limit | Resistance lower exceed |
| Current resistance value $>$ resistance upper limit | Resistance upper exceed |
| Voltage upper limit \leq current voltage value \leq voltage lower limit | Voltage GD |

| | |
|---|----------------------|
| Current voltage value < voltage lower limit | Voltage lower exceed |
| Current voltage value > voltage upper limit | Voltage upper exceed |

Example: Select comparator function to turn on, the current comparator value is set as follows:

| Resistance lower limit | Resistance upper limit | voltage lower limit | voltage upper limit |
|------------------------|------------------------|---------------------|---------------------|
| 80 mΩ | 120 mΩ | 1.45V | 1.55V |

1. Sorting results table

| Battery | Internal resistance | Voltage | Sorting Result |
|---------|---------------------|---------|---|
| 1 | 100 mΩ | 1.40 V | Resistance GD Voltage lower exceed |
| 2 | 100 mΩ | 1.50 V | Resistance GD Voltage GD |
| 3 | 100 mΩ | 1.60 V | Resistance GD Voltage upper exceed |
| 4 | 60 mΩ | 1.40 V | Resistance lower exceed Voltage lower exceed |
| 5 | 60 mΩ | 1.50 V | Resistance lower exceed Voltage GD |
| 6 | 60 mΩ | 1.60V | Resistance lower exceed Voltage upper exceed |
| 7 | 150 mΩ | 1.40 V | Resistance upper exceed Voltage lower exceed |
| 8 | 150 mΩ | 1.50 V | Resistance upper exceed Voltage GD |
| 9 | 150 mΩ | 1.60 V | Resistance upper exceed Voltage upper exceed |

Set Comparator Threshold

7. Press **[SYS]** key on the test page and switch to the comparator page.

| COMPARATOR | | | |
|------------|-------|-----------------|-----------------|
| COMP | OFF | BEEP | PASS |
| MODE | | V | |
| COMP GROUP | | | |
| NO | 002 | ABS | OFF |
| RESIS | | | |
| RANG | 300mΩ | UPPER 300.00mΩ | LOWER 288.00mΩ |
| VOLTAGE | | | |
| RANG | 10V | UPPER 01.00000V | LOWER 00.00000V |

COMP
T
LE

Press up, down, left and right keys to move cursor position, press **[ENTER]** key to select the comparator switch, then press left or right button to set comparator to turn on or off.

Set Comparator Resistance Range

7. Press **[SYS]** key on the test page and switch to the comparator page.

| COMPARATOR | | | |
|------------|-------|-----------------|-----------------|
| COMP | OFF | BEEP | PASS |
| MODE | | V | |
| COMP GROUP | | | |
| NO | 002 | ABS | OFF |
| RESIS | | | |
| RANG | 300mΩ | UPPER 300.00mΩ | LOWER 288.00mΩ |
| VOLTAGE | | | |
| RANG | 10V | UPPER 01.00000V | LOWER 00.00000V |

COMP
T
LE

2. Press up, down, left and right keys to move cursor to the resistance range position.

| COMPARATOR | | | |
|------------|-------|-------|-----------|
| COMP | OFF | BEEP | PASS |
| MODE | | V | |
| COMP GROUP | | | |
| NO | 002 | ABS | OFF |
| RESIS | | | |
| RANG | 300mΩ | UPPER | 300.00mΩ |
| | | LOWER | 288.00mΩ |
| VOLTAGE | | | |
| RANG | 10V | UPPER | 01.00000V |
| | | LOWER | 00.00000V |

COMP
T
LE

Press [ENTER] to select the resistance range to be set, then press left or right key to set the resistance range. Press [ENTER] key again for set completion. Press [SYS] key to return to the measurement page.

Set Comparator Voltage Threshold

1. Press [SYS] key on the test page and switch to the comparator page.

| COMPARATOR | | | |
|------------|-------|-------|-----------|
| COMP | OFF | BEEP | PASS |
| MODE | | V | |
| COMP GROUP | | | |
| NO | 002 | ABS | OFF |
| RESIS | | | |
| RANG | 300mΩ | UPPER | 300.00mΩ |
| | | LOWER | 288.00mΩ |
| VOLTAGE | | | |
| RANG | 10V | UPPER | 01.00000V |
| | | LOWER | 00.00000V |

COMP
T
LE

2. Press up, down, left and right keys to move cursor to the voltage range position.

| COMPARATOR | | | |
|------------|-------|-------|-----------|
| COMP | OFF | BEEP | PASS |
| MODE | | V | |
| COMP GROUP | | | |
| NO | 002 | ABS | OFF |
| RESIS | | | |
| RANG | 300mΩ | UPPER | 300.00mΩ |
| | | LOWER | 288.00mΩ |
| VOLTAGE | | | |
| RANG | 10V | UPPER | 01.00000V |
| | | LOWER | 00.00000V |

COMP
T
LE

Press [ENTER] to select the voltage range to be set, then press left or right key to set the voltage range. Press [ENTER] key again for set completion. Press [SYS] key to return to the measurement page.

Set Comparator Resistance Threshold

1. Press [SYS] key on the test page and switch to the comparator page.

| COMPARATOR | | | |
|------------|-------|-------|-----------|
| COMP | OFF | BEEP | PASS |
| MODE | | V | |
| COMP GROUP | | | |
| NO | 002 | ABS | OFF |
| RESIS | | | |
| RANG | 300mΩ | UPPER | 300.00mΩ |
| | | LOWER | 288.00mΩ |
| VOLTAGE | | | |
| RANG | 10V | UPPER | 01.00000V |
| | | LOWER | 00.00000V |

COMP
T
LE

2. Press up, down, left and right keys to move cursor to the

resistance upper limit position.

| COMPARATOR | | | |
|------------|-------|-------|-----------|
| COMP | OFF | BEEP | PASS |
| MODE | | V | |
| COMP GROUP | | | |
| NO | 002 | ABS | OFF |
| RESIS | | | |
| RANG | 300mΩ | UPPER | 300.00mΩ |
| VOLTAGE | | | |
| RANG | 10V | UPPER | 01.00000V |
| | | LOWER | 00.00000V |

COMP
T
LE

Press **[ENTER]** to select resistance upper limit to be set, press left or right button to move cursor, press up and down buttons to set resistance upper limit value. Press **[ENTER]** key again to complete setting.

3. Press up, down, left and right keys to move the cursor to resistance lower limit position.

| COMPARATOR | | | |
|------------|-------|-------|-----------|
| COMP | OFF | BEEP | PASS |
| MODE | | V | |
| COMP GROUP | | | |
| NO | 002 | ABS | OFF |
| RESIS | | | |
| RANG | 300mΩ | UPPER | 300.00mΩ |
| VOLTAGE | | | |
| RANG | 10V | UPPER | 01.00000V |
| | | LOWER | 288.00mΩ |

COMP
T
LE

Press **[ENTER]** to select resistance lower limit to be set, press left and right to move cursor, then press up and down to set resistance lower limit value. Press **[ENTER]** key again to set complete setting.

Set Comparator Voltage Threshold

1. Press **[SYS]** key on the test page and switch to the comparator page.

| COMPARATOR | | |
|------------|-------|---------------------------------|
| COMP | OFF | BEEP PASS MODE V |
| COMP GROUP | | |
| NO | 002 | ABS OFF |
| RESIS | | |
| RANG | 300mΩ | UPPER 300.00mΩ LOWER 288.00mΩ |
| VOLTAGE | | |
| RANG | 10V | UPPER 01.00000V LOWER 00.00000V |

2. Press up, down, left and right keys to move cursor to the voltage upper limit position.

| COMPARATOR | | |
|------------|-------|---------------------------------|
| COMP | OFF | BEEP PASS MODE V |
| COMP GROUP | | |
| NO | 002 | ABS OFF |
| RESIS | | |
| RANG | 300mΩ | UPPER 300.00mΩ LOWER 288.00mΩ |
| VOLTAGE | | |
| RANG | 10V | UPPER 01.00000V LOWER 00.00000V |

Press **[ENTER]** to select voltage upper limit to be set, press left and right button to move cursor, then press up and down keys to set voltage upper limit value. Press **[ENTER]** key again for set completion.

3. Press up, down, left and right keys to move the cursor to the voltage lower limit position.

| | | |
|------------|-----------------|-----------------|
| COMPARATOR | | |
| COMP OFF | BEEP PASS | MODE V |
| COMP GROUP | | |
| NO 002 | ABS OFF | |
| RESIS | | |
| RANG 300mΩ | UPPER 300.00mΩ | LOWER 288.00mΩ |
| VOLTAGE | | |
| RANG 10V | UPPER 01.00000V | LOWER 00.00000V |

Press **[ENTER]** to select voltage lower limit to be set, press left and right button to move cursor, then press up and down keys to set voltage lower limit value. Press **[ENTER]** key again for set completion. Press **[SYS]** key to return to the measurement page.

4.5 Set Comparison Buzzer

When compartor function is used, buzzer can beep based on judgment result. The following status can be set. The initial setting is "DG beep and NG beep" .

| | |
|---------|--|
| DG beep | When judgment result is "GD (pass)", the buzzer sounds a beep. |
| NG beep | When the judgment result is "NG (failed)", the buzzer sounds a beep. |

1. Press **[SYS]** key on the test page and switch to the comparator page.

| | | | | | | |
|------------|-------|-------|-----------|--|-------|-----------|
| COMPARATOR | | | | <div>COMP</div> <div>T</div> <div>LE</div> | | |
| COMP | OFF | BEEP | PASS | | MODE | V |
| COMP GROUP | | | | | | |
| NO | 002 | ABS | OFF | | | |
| RESIS | | | | | | |
| RANG | 300mΩ | UPPER | 300.00mΩ | | LOWER | 288.00mΩ |
| VOLTAGE | | | | | | |
| RANG | 10V | UPPER | 01.00000V | | LOWER | 00.00000V |

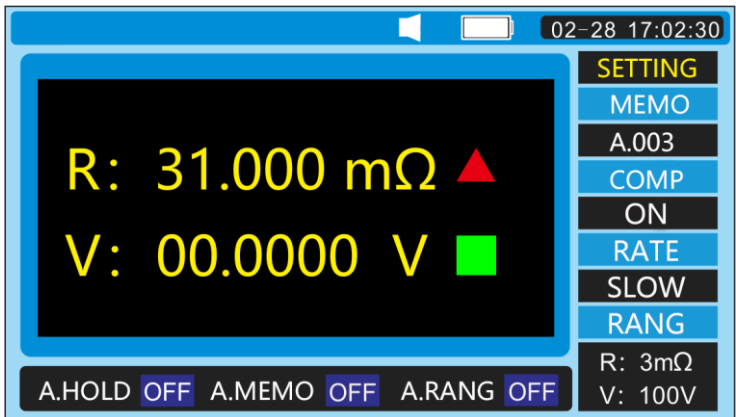
2. Press up, down, left and right keys to move cursor to the beep position.

| | | | | | | |
|------------|-------|-------|-----------|--|-------|-----------|
| COMPARATOR | | | | <div>COMP</div> <div>T</div> <div>LE</div> | | |
| COMP | OFF | BEEP | PASS | | MODE | V |
| COMP GROUP | | | | | | |
| NO | 002 | ABS | OFF | | | |
| RESIS | | | | | | |
| RANG | 300mΩ | UPPER | 300.00mΩ | | LOWER | 288.00mΩ |
| VOLTAGE | | | | | | |
| RANG | 10V | UPPER | 01.00000V | | LOWER | 00.00000V |

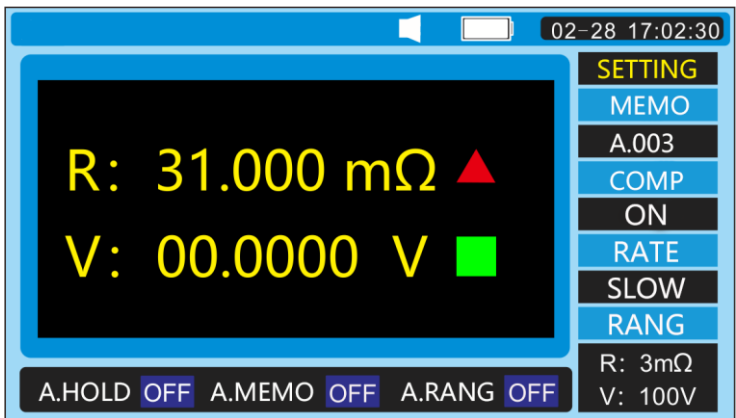
Press **[ENTER]** key to select a desired beep mode, then press left and right button to switch between the GD and NG sounds. Press **[ENTER]** key again to complete setting.

3. Turn on beep

Press **[BEEP]** on the measurement page to turn on / off beep.



Beep off



Beep on

Chapter 5 Storage Function

5.1 Overview

Up to 2400 sets of data (date and time, resistance, voltage, temperature, comparator threshold, decision result) can be stored. After test is completed, the stored data can be displayed or transferred to PC.



The following table shows the structure of the memory:

| Unit (12 units) | Memory address (200 groups) | | | | | | |
|--------------------|-----------------------------|---|---|-------|-----|-----|-----|
| A | | 2 | 3 | ..... | 198 | 199 | 200 |
| B | | 2 | 3 | ..... | 198 | 199 | 200 |
| C | | 2 | 3 | ..... | 198 | 199 | 200 |
| D | | 2 | 3 | ..... | 198 | 199 | 200 |
| E | | 2 | 3 | ..... | 198 | 199 | 200 |
| F | | 2 | 3 | ..... | 198 | 199 | 200 |
| G | | 2 | 3 | ..... | 198 | 199 | 200 |
| H | | 2 | 3 | ..... | 198 | 199 | 200 |
| I | | 2 | 3 | ..... | 198 | 199 | 200 |
| J | | 2 | 3 | ..... | 198 | 199 | 200 |
| K | | 2 | 3 | ..... | 198 | 199 | 200 |
| L | | 2 | 3 | ..... | 198 | 199 | 200 |

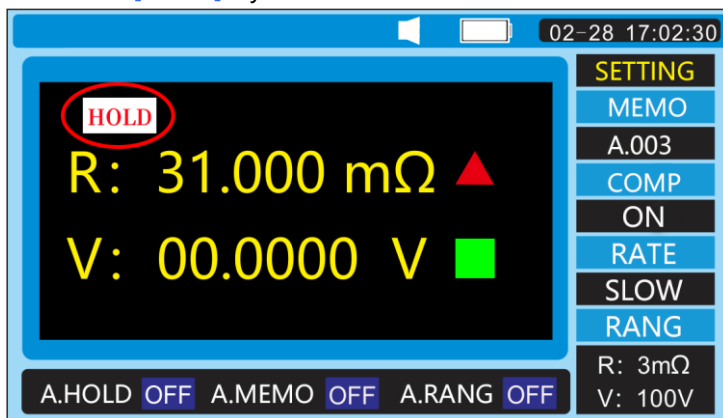
5.2 Store to Memory

Press **[HOLD]** key, then press **[MEMO]** button to save the current measurement.

5.2.1 Save test values to memory

1. If data is stored in an address different from the displayed memory address, use  /  key to change the address unit number. This can be done at any time as long as the storage function is turned on.

2. Use **[HOLD]** key to hold the test value.



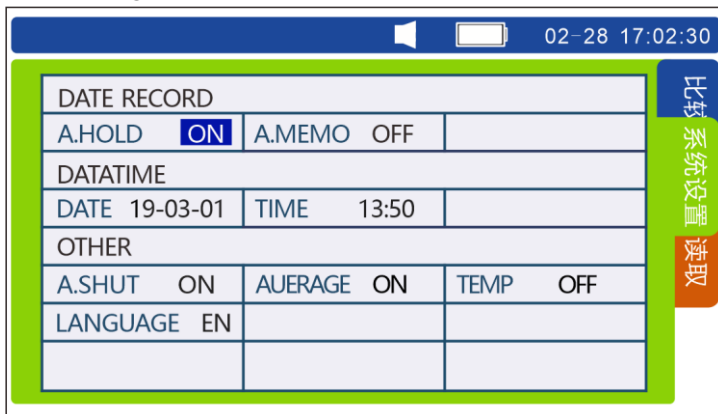
3. Use **[MEMO]** key to store the test value. The test value will be stored in the selected memory address.

4. When complete saving, the next memory address will be displayed to save the data. Cancel current data hold

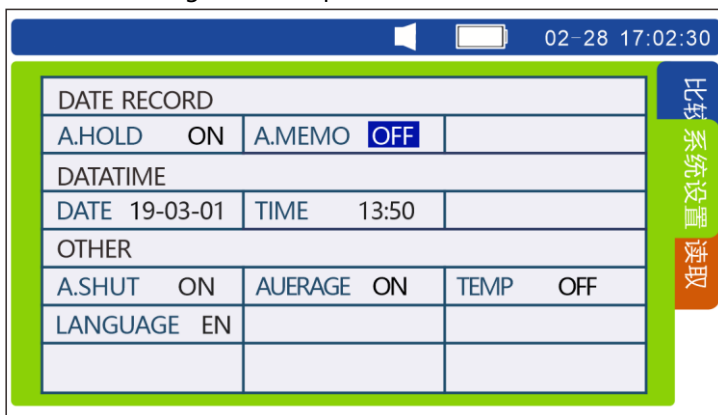
5.3 Turn off Storage Function

Turn off Storage Function

1. Press **[SYS]** key on the test page, switch to system setup page.



2. Press up, down, left and right keys to move the cursor to automatic storage function position.



Press **[ENTER]** key to select the setting auto memory function ON or OFF, press left and right button to switch OFF. Press **[ENTER]** key again to turn off the auto memory function. Press **[ESC]** key to return to the measurement page.

5.4 Read Stored Data

Can read and display stored test values. The test value in the selected memory address will be displayed.

1. Press **[FILE]** button on the test page, switch to file reading page.

| | | |
|---------------|---------------|---------------|
| RECORD NO. | | |
| NO. | 001 | |
| RECORD TIME | | |
| DATE 03-01 | TIME 10:59:54 | |
| RECORD DATA | | |
| TEMP--- | | |
| RES 000.01mΩ | UPP 300.00mΩ | LOW 288.00mΩ |
| VOLT 0.00010V | UPP 01.00000V | LOW 00.00000V |

2. Press / to select memory address unit. Press

/ to select a digit.



NOTE

- The comparator data results being read can be displayed.
- Users cannot select a memory address that has no data.
- If there is no data stored, data in the space of the corresponding memory address will be blank.
- The temperature will be displayed by using the data from 9705 clip-type test leads with temperature sensor to test.

5.5 Delete Stored Data

5.5.1 Delete a Set of Data

1. Press **[FILE]** button on the test page to switch to file reading page.

The screenshot shows the 'FILE' screen with a blue header bar containing a speaker icon, a battery icon, and the date/time '02-28 17:02:30'. On the right, there are three vertical buttons: 'CO' (blue), 'SE' (green), and 'FILE' (orange). The main area is a table with the following rows:

| | | |
|---------------|---------------|---------------|
| RECORD NO. | | |
| NO. | A.001 | |
| RECORD TIME | | |
| DATE 03-01 | TIME 10:59:54 | |
| RECORD DATA | | |
| TEMP---- | | |
| RES 000.01mΩ | UPP 300.00mΩ | LOW 288.00mΩ |
| VOLT 0.00010V | UPP 01.00000V | LOW 00.00000V |

2. Press / to select the memory address unit.

Press / to select a digit.

3. Press **[CLEAR]** key will prompt the deletion of the current group data.

The screenshot shows the 'FILE' screen with the same table as before. A grey dialog box is overlaid in the center with the text:

PRESS NETER TO DEL A.002
PRESS ESC TO EXIT

4. Press **[ENTER]** key again to confirm deletion of the data stored in the selected memory address.

5.5.2 Delete One Unit (200 groups) of Data

1. Press **[FILE]** button on the test page to switch to file reading page.

| | | |
|---------------|---------------|---------------|
| RECORD NO. | | |
| NO. | A.001 | |
| RECORD TIME | | |
| DATE | 03-01 | TIME 10:59:54 |
| RECORD DATA | | |
| TEMP---- | | |
| RES 000.01mΩ | UPP 300.00mΩ | LOW 288.00mΩ |
| VOLT 0.00010V | UPP 01.00000V | LOW 00.00000V |

2. Press / to select the memory address unit.

Press / to select a digit.

3. Press **[CLEAR]** key will 2 times prompt the deletion of the unit data.

| | | |
|---------------|---------------|---------------|
| RECORD NO. | | |
| NO. | A.001 | |
| RECORD TIME | | |
| DATE | 03-01 | TIME 10:59:54 |
| RECORD DATA | | |
| TEMP---- | | |
| RES 000.01mΩ | UPP 300.00mΩ | LOW 288.00mΩ |
| VOLT 0.00010V | UPP 01.00000V | LOW 00.00000V |

4. Press **[ENTER]** key again to confirm deletion of the data stored in the selected unit.

5.5.3 Delete All Data

1. Press **[FILE]** button on the test page to switch to file reading page.

| | | |
|---------------|---------------|---------------|
| RECORD NO. | | |
| NO. | A.001 | |
| RECORD TIME | | |
| DATE | 03-01 | TIME 10:59:54 |
| RECORD DATA | | |
| TEMP---- | | |
| RES 000.01mΩ | UPP 300.00mΩ | LOW 288.00mΩ |
| VOLT 0.00010V | UPP 01.00000V | LOW 00.00000V |

2. Press / to select the memory address unit.

Press / to select a digit.

3. Press **[CLEAR]** key will 3 times prompt the deletion of all data.

| | | |
|---------------|---------------|---------------|
| RECORD NO. | | |
| NO. | A.001 | |
| RECORD TIME | | |
| DATE | 03- | |
| RECORD D | | |
| TEMP---- | | |
| RES 000.01mΩ | UPP 300.00mΩ | LOW 288.00mΩ |
| VOLT 0.00010V | UPP 01.00000V | LOW 00.00000V |

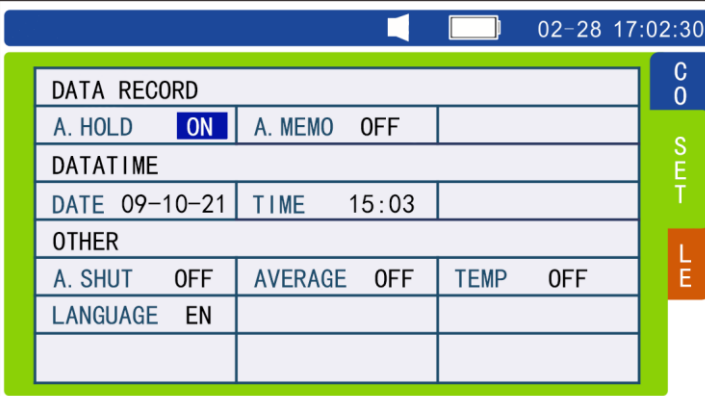
4. Press **[ENTER]** key again to confirm the deletion of all stored data.

Chapter 6 Other Functions

6.1 Average Value Function

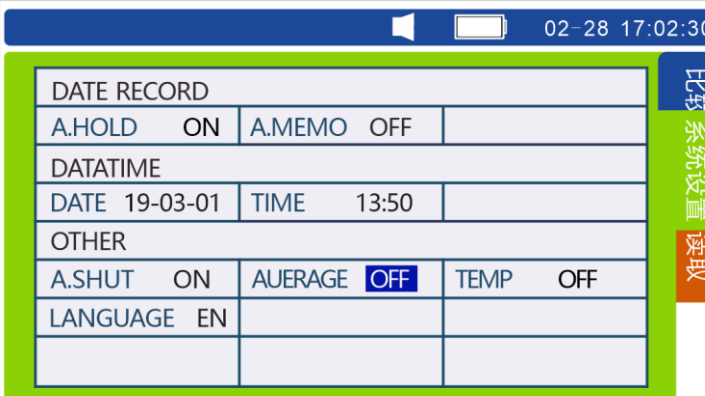
When test value is unstable, the average function can be used. The average number of times can be 2, 3 or 4 when using the average function.

1. Press **[SYS]** key on the test page to switch to the system setup page.



| DATA RECORD | | | |
|-------------|----------|---------|-------|
| A. HOLD | ON | A. MEMO | OFF |
| DATETIME | | | |
| DATE | 09-10-21 | TIME | 15:03 |
| OTHER | | | |
| A. SHUT | OFF | AVERAGE | OFF |
| LANGUAGE | EN | | |
| | | | |

2. Press up, down, left and right keys to move cursor to the average number of times.



| DATE RECORD | | | |
|-------------|----------|---------|-------|
| A. HOLD | ON | A. MEMO | OFF |
| DATETIME | | | |
| DATE | 19-03-01 | TIME | 13:50 |
| OTHER | | | |
| A. SHUT | ON | AVERAGE | OFF |
| LANGUAGE | EN | | |
| | | | |

Press **[ENTER]** key to select the average number of times wanted to set, press left or right button to toggle OFF, 2, 3, 4. Press **[ENTER]** key again to complete setting. Press **[ESC]** key to return to the measurement page.



NOTE

- Average value function is available when testing resistance values.
- The average value function is used to change the display update rate of the test value.
- If users don't need to use average value function, select "OFF" .

6.2 Auto Hold Function

This feature is used to automatically confirm stability of test values and hold test values.

Set Auto Hold Function

1. Press **[SYS]** key on the test page to switch to system setup page.

| DATA RECORD | | | |
|-------------|----------|---------|-------|
| A. HOLD | ON | A. MEMO | OFF |
| DATETIME | | | |
| DATE | 09-10-21 | TIME | 15:03 |
| OTHER | | | |
| A. SHUT | OFF | AVERAGE | OFF |
| LANGUAGE | EN | | |
| | | | |

On the right side of the screen, there is a vertical menu with the following options: C, O, S, E, T, L, E. The 'S' and 'E' are highlighted in green, and the 'T' is highlighted in orange.

Press **[ENTER]** to select whether to turn on the auto save function, press left or right button to switch OFF and ON. Press **[ENTER]** key again to complete setting. Press **[ESC]** key to return to measurement page.

**NOTE**

- When "-. - - -" is displayed, auto hold function is not available.
- When automatic storage function and the auto hold function are used at the same time, the value is automatically saved if the test value is automatically stored.

6.3 Auto Storage Function

This function automatically stores the test value into memory immediately after the test value is held.

Set Auto Storage Function

1. Press **[SYS]** key on the test page to switch to system setup page.

The screenshot shows a handheld device screen with a blue header bar containing a speaker icon, a battery icon, and the date/time '02-28 17:02:30'. The main content area is titled 'DATA RECORD' and contains several settings. A green vertical bar on the right side of the screen has the text 'CO', 'SET', and 'LE' in white. The settings are as follows:

| | | | |
|-------------|----------|---------|-------|
| DATA RECORD | | | |
| A. HOLD | ON | A. MEMO | OFF |
| DATETIME | | | |
| DATE | 09-10-21 | TIME | 15:03 |
| OTHER | | | |
| A. SHUT | OFF | AVERAGE | OFF |
| LANGUAGE | EN | | |
| | | | |

2. Press up, down, left and right keys to move cursor to the auto storage function.

The screenshot shows the same handheld device screen, but the 'A. MEMO' setting is now 'OFF'. The green vertical bar on the right side of the screen now has the text '比较' (Compare), '系统设置' (System Settings), and '读取' (Read) in white. The settings are as follows:

| | | | |
|-------------|----------|---------|-------|
| DATE RECORD | | | |
| A.HOLD | ON | A.MEMO | OFF |
| DATETIME | | | |
| DATE | 19-03-01 | TIME | 13:50 |
| OTHER | | | |
| A.SHUT | ON | AUERAGE | ON |
| LANGUAGE | EN | | |
| | | | |

Press **[ENTER]** key to select setting turn on or off auto memory function, press left or right button to toggle OFF and ON. Press **[ENTER]** key again to complete setting. Press **[ESC]** key to return to the

measurement page.



NOTE When auto storage function and auto hold function are used at the same time, the value is automatically stored if the test value is automatically held.

6.4 Auto Power off Function

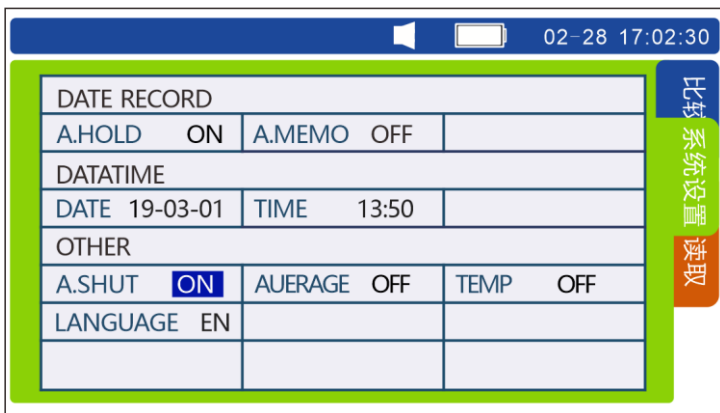
Automatic power save function is used to control power consumption of the instrument. When there is no key operation for about 10 minutes, the instrument will be automatically powered off when one of the following conditions continues.

- When the resistance value shows "- - - -"
- Hold state (test is stopped)
- Non-test status (each setting screen, data reading screen)
- Communication completion status

1. Press **[SYS]** key on the test page to switch to system setup page.

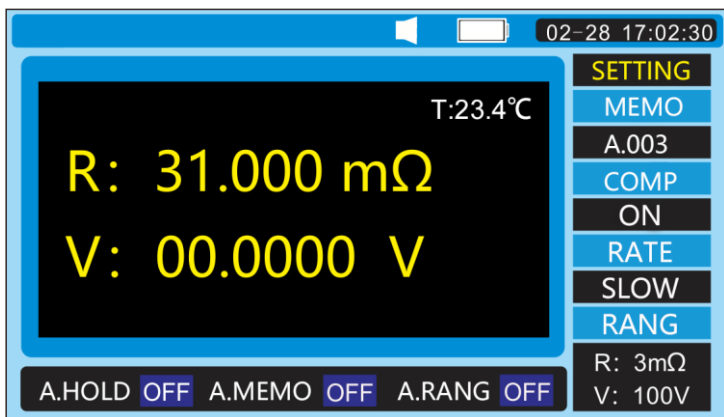
| DATA RECORD | | | |
|-------------|----------|---------|-------|
| A. HOLD | ON | A. MEMO | OFF |
| DATETIME | | | |
| DATE | 09-10-21 | TIME | 15:03 |
| OTHER | | | |
| A. SHUT | OFF | AVERAGE | OFF |
| TEMP | OFF | | |
| LANGUAGE | EN | | |
| | | | |

2. Press up, down, left and right keys to move cursor to auto power off.







Press **[ENTER]** key to select auto power off function, press left or right button to toggle OFF and ON. Press **[ENTER]** key again to complete setting. Press **[ESC]** key to return to the measurement page.

6.5 Battery Capacity Remaining Display



Battery remaining capacity display

| | |
|---|--|
| Battery remaining Capacity display | Battery status |
|  | Fully charged status |
|  | Battery status after use approximately 1.5 |

| | |
|---|--|
| | hours. |
|  | Battery status after use about 3 hours. This symbol is also displayed when the battery is about to be discharged. At this time, users should charge in time. |
|  | Battery status after use approximately 3.5 hours. When this indicator is displayed, it should be charged immediately. |

Chapter 7 Parameters

7.1 General Parameters

| | |
|---|--|
| Measurement function | <ul style="list-style-type: none"> • Test battery internal resistance • Test the voltage inside the battery (only DC voltage) • Temperature measurement |
| Test range <ul style="list-style-type: none"> • Resistance • Voltage • Temperature | 0.0000 mΩ ~ 31.000 Ω (5 ranges) 0.00000 V ~ ± 1000.00 V (3 ranges) -10.0°C ~ 60.0°C (1 range) |
| Test method <ul style="list-style-type: none"> • Resistance • Temperature | AC four terminal measurement method Open circuit voltage: maximum 27 V PT1000 platinum temperature sensor (voltage output method) |
| Test current | 0.1 mA ~ 100 mA |
| Constant current anomaly | Display “- - - -” |
| Broken-wire detection | Display “- - - -” |
| Over input | Display “OF” |
| Input terminal | <ul style="list-style-type: none"> • Resistance, voltage test terminal |

| | |
|--|---|
| | <p>Banana plug</p> <p>Maximum input voltage: DC ± 1000 V</p> <p>(Cannot input AC)</p> <p>Input resistance: > 5 MΩ</p> <ul style="list-style-type: none"> • Temperature sensor input terminal <p>Headphone jack (3.5 mm diameter)</p> |
|--|---|

Clock

| | |
|-----------------------|---|
| Characteristic | 24-hour clock; Automatic adjustment time |
| Accuracy | About +/-4 minutes / month |
| Other characteristics | <p>Internal backup lithium battery</p> <p>Battery life: about 2 years</p> |

| | |
|------------------------------------|---|
| Operation Keys | Rubber keys |
| Display | 4.3 inches LCD |
| Precision Guarantee Period | 1 year |
| Operating Temperature and Humidity | 0°C~40°C <80%RH (No condensation) |
| Storage Temperature and Humidity | -10°C~60°C <80%RH (No condensation) |
| Operating Environment | Indoor, highest altitude 2000 m |
| Power Supply | Lithium battery 1700 mAh |
| Voltage | 12V |
| Max Power Consumption | 5VA |
| Continuous working time | Approx.3.5 hours |
| Size | Approx. 205x110x55 |
| Weight | Approx. 810g |
| Maximum input voltage | Positive and negative test terminal: DC $\pm 1000V$ |

7.2 Accuracy

Resistance measurement

| Range | Max display value | Resolution | Accuracy | Test current |
|---------------|-------------------|-----------------|-------------------------------|--------------|
| 3m Ω | 3.1000m Ω | 0.1 $\mu\Omega$ | $\pm 1.0\%$ rdg. ± 8 dgt. | 100mA |
| 30m Ω | 31.000m Ω | 1 $\mu\Omega$ | | 100mA |
| 300m Ω | 310.00m Ω | 10 $\mu\Omega$ | $\pm 1.0\%$ rdg. ± 6 dgt. | 10mA |
| 3 Ω | 3.1000 Ω | 100u Ω | $\pm 1.0\%$ rdg. ± 6 dgt. | 1mA |
| 30 Ω | 31.000 Ω | 1m Ω | $\pm 1.0\%$ rdg. ± 6 dgt. | 100uA |

1: Measuring current error within $\pm 10\%$

2: Add ± 3 dgt for super-fast, ± 2 dgt for fast, and ± 2 dgt for medium speed.

CKT3554A Voltage measurement

| Range | Max display value | Resolution | Accuracy |
|-------|-------------------|------------|---------------|
| 10V | $\pm 10.0000V$ | 100uV | 0.01%rdg+3dgt |
| 100V | $\pm 100.000V$ | 1mV | 0.01%rdg+3dgt |

CKT3554B Voltage measurement

| Range | Max display value | Resolution | Accuracy |
|-------|-------------------|------------|---------------|
| 10V | $\pm 10.0000V$ | 100uV | 0.01%rdg+3dgt |
| 300V | $\pm 100.000V$ | 1mV | 0.01%rdg+3dgt |

CKT3554D Voltage measurement

| Range | Max display value | Resolution | Accuracy |
|-------|-------------------|------------|---------------|
| 10V | $\pm 10.0000V$ | 100uV | 0.01%rdg+3dgt |
| 100V | $\pm 100.000V$ | 1mV | 0.01%rdg+3dgt |
| 1000V | $\pm 1000.00V$ | 10mV | 0.01%rdg+3dgt |

Temperature measurement

| Range | Max display value | Resolution | Accuracy |
|-------------|-------------------|------------|-----------------|
| -10 to 60°C | 60.0°C | 0.1°C | $\pm 1^\circ C$ |

Chapter 8 Maintenance and Repair

8.1 Troubleshooting



NOTE

Do not modify the instrument. Only our service personnel can disassemble or repair the instrument. Failure to follow precautionary measures can result in fire, electric shock or injury.



NOTE

When send instrument for repair, battery and components should be removed to prevent damage during transportation. Add padding material to prevent the instrument from moving inside the box. Try to clarify the problems encountered as much as possible. We are not responsible for damage during transportation.

If the instrument is not working properly, please check the following table:

| Problem | Inspection Item |
|---|---|
| When POWER key is pressed, nothing is displayed on the screen. | Does the battery still have power? → If there is no battery, please charge |
| Displaying abnormal measurement values on the screen "- - - -" | Is the test cable connected correctly? → If not connected, connect correctly Is the test lead broken? → If it breaks, replace it with a new one. Is the clear zero correct? → If clear zero is not correctly adjusted, re-zero. Is range selected correctly? → If the range is not selected properly, use the range key to select range. |
| Ω key and V key are not responding | Is the comparator function turned on? → These function keys are invalid when comparator function is turned on. |
| MEMO key is not responding | Is the data held? → If not, use HOLD key to hold the data. |
| Abnormal comparator result | Is the comparator threshold set correctly? → If the settings are not correct, set the comparator threshold properly |

Chapter 9 Appendix

9.1 The Influence of Extend Test leads and Induced Voltage

Test leads can usually be extended by customization. If users would like to extend test leads, please contact us. Users are not allowed to extend test leads privately.

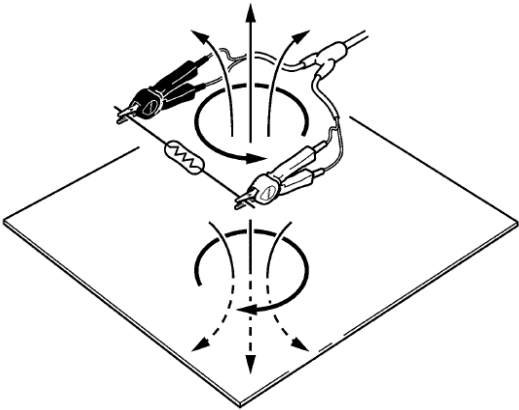
Reduce induced voltage

When the instrument tests a resistor with a small resistance under AC power, the induced voltage will affect the test. The induced voltage causes the current in the instrument to create an inductive coupling inside the wire that will affect the in-line signal. Since the alternating current (reference signal) is 90 degrees out of phase with the induced voltage, the synchronous detection circuit can remove the induced voltage when the voltage is low. However, when voltage is high, the induced voltage will distort the signal and produce an incorrect synchronous detection signal. The instrument detects the internal induced voltage, if the voltage rises to a certain height, it will generate a wrong test signal. Reducing the length of test leads, especially reducing the length of the branch, will attenuate the induced voltage. When using standard test leads, the wiring during the zeroing and test is very different within the $3\text{m}\Omega$ range, the induced voltage will affect the resulting value deviation by approximately 15 dgt.

9.2 The Effect of Eddy Current

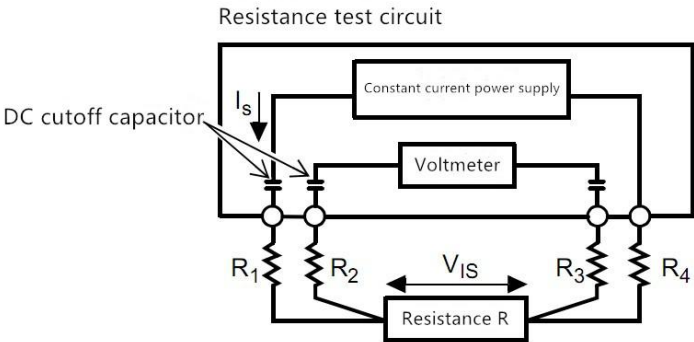
The alternating current in the instrument will generate eddy currents around metal plate, which in turn will induce an induced voltage inside the test leads. Since the phase of induced voltage is 180 degrees out of phase with the alternating current (reference current), the synchronous detection current cannot eliminate the induced voltage, resulting in a test error. The eddy current effect is unique to the AC power ohmmeter. The distance between the metal part including the metal plate and test leads (branch

portion) should be reduced to avoid the influence of eddy current.



9.3 AC Four Terminal Measurement Method

This instrument uses AC four-terminal measurement method, so there is no need to consider internal resistance of the test leads and the contact resistance between the test leads and the object under test when measuring the resistance.



The values from R1 to R4 are internal resistance value of the test leads plus value of the contact resistance.

The AC current (I_s) flowing from the SOURCE port of the instrument flows through the battery under test. The voltage drop (VIS) of the internal resistance of battery is measured by SENSE port. At this time, since SENSE port is connected to an internal voltmeter with a very high impedance, no current flows through the flats on R2 and R3 representing the resistance and contact resistance of the test leads. Therefore, there is no voltage drop across resistors R2 and R3, since voltage drop across test leads resistance and contact resistance is very small so it can be ignored. In the instrument, the synchronous detection system is used to divide the internal resistance into impedance and reactance, and only the actual part is displayed.

If the internal resistance of the test leads, the contact resistance between test object and the test leads, or the contact resistance between the test leads and the instrument increases, the instrument will supply an abnormal current to the measured object, which will result in a test status error. The "- - - -" symbol is displayed in the place where the resistance test is performed.

9.4 The Effect of Current Density

The measurement object is wide or thick

When the measured object has a width or thickness, such as a plate or a block, it is difficult to obtain accurate measurement values using clip type or probe type test leads. The measured value may be one or two percentage points change due to the contact pressure or angle. For example, when testing a metal plate with a size of W 300 X L 370 X t 0.4, the results measured from the same place are significantly different, as shown below:

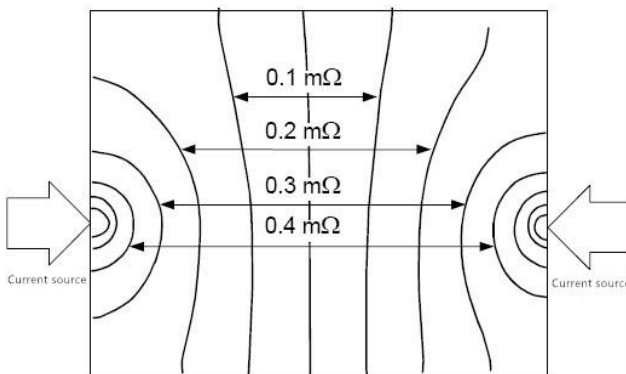
When using a 0.2 mm probe type test leads: 1.1 m Ω

When using a 0.5 mm probe type test leads: 0.92 - 0.97 m Ω

When using 9287-10 clip type test leads: 0.85 - 0.95 Ω

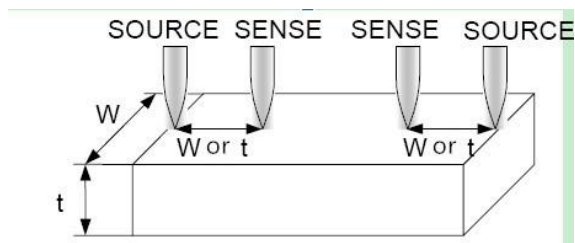
Having such result is not only due to the contact resistance between

the probe and the measured object, but also the distribution inside the measured object. Figure 1 is a diagram of an equipotential line structure on a metal plate. It is like a graph of the relationship between wind and atmospheric pressure used in weather forecasting. The current density between the equipotential lines that are close to each other is high, and the current density between the equipotential lines that are far apart is low. The figure shows a large voltage change near the current source. Because the current is separated by the metal plate in the middle, there is a higher current density. For this reason, the port that detects the voltage is close to one of the current sources, and it is the smallest change in the contact position that causes a large change in the measured value. These effects can be avoided by using four-port test leads or similar test leads to sense the voltage inside the current source. In other words, if the width (W) or thickness (t) portion of the article is tested, the current distribution is likely to be stable.



(Figure1)

Connect a current of 1 A to the port of a metal plate (W300 X L370 X t0.4) with current distribution on the equipotential line separated by 50 mV. For proper measurement, as shown in Figure 2, position the SENSE terminal away from the SOURCE terminal at the metal plate width or thickness range.



(Figure 2)